

Appl. No. 10/676,411
Amdt. Dated January 11, 2006
Reply to Office action of September 19, 2005

REMARKS/ARGUMENTS

Claims 1-24 are pending in the present application.

This Amendment is in response to the Office Action mailed September 19, 2005. In the Office Action, the Examiner rejected claims 1, 5-8 under 35 U.S.C. §102(b); and claims 2-4, and 9-24 under 35 U.S.C. §103(a). Reconsideration in light of the remarks made herein is respectfully requested.

Rejection Under 35 U.S.C. § 102

1. In the Office Action, the Examiner rejected claims 1, 5-8 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,034,304 issued to Feely ("Feely"). Applicants respectfully traverse the rejection and contend that the Examiner has not met the burden of establishing a prima facie case of anticipation.

Feely discloses a photosensitive compounds and thermally stable and aqueous developable negative images. A number of halogenated organic materials are suitable for use as photoacid generators to produce aqueously developable images on deep UV exposure (Feely, col. 5, lines 30-35). Submicron images on the order of about 0.2 to 1 micron are capable of being produced with the photosensitive composition using an X-ray source (Feely, col. 6, lines 51-53).

Feely does not disclose, either expressly or inherently, at least one of (1) forming a resist using a highly absorbing material; (2) thinning the resist to a pre-determined thickness used as an imaging layer; and (3) improving efficiency of a photoactive acid generator (PAG) to capture secondary electrons produced by an ionizing radiation in the resist, as recited in independent claim 1.

Feely merely discloses photosensitive compounds for use as photoacid generators in combination with acid hardening resin. The acid hardening resin is not the same as a resist of a highly absorbing material. Furthermore, the resin is not thinned to be used as an imaging layer. The thickness ranges from approximately 0.6 μm to 10 μm (Feely, col. 8, lines 48-49; col. 9, lines 5-6; col. 9, lines 33-34; Tables 2-5). This is an order of magnitude larger than the thin thickness of less than 0.1 μm or 100 nm as recited in claim 5.

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The photoacid generators are used in combination of the acid hardening resins without any improved efficiency. Feely does not disclose capturing secondary electrons. In addition, there is no increase of a PAG concentration in the resist solution. The weight ratio is determined at the time the resist solution is prepared (Feely, col. 8, lines 16-22; col. 8, lines 56-59; col. 9, lines 11-14; Tables 2-5, Weight Ratio column), not by controlling moieties proximal to a cleavage bond in the PAG, as recited in claim 8.

To anticipate a claim, the reference must teach every element of the claim. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Vergara Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ 2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the...claim." Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ 2d 1913, 1920 (Fed. Cir. 1989). Since the Examiner failed to show that Feely teaches or discloses any one of the above elements, the rejection under 35 U.S.C. §102 is improper.

Therefore, Applicants believe that independent claims 1, 9, and 17 and their respective dependent claims are distinguishable over the cited prior art references. Accordingly, Applicants respectfully request the rejection under 35 U.S.C. §102(b) be withdrawn.

Rejections Under 35 U.S.C. § 103(a)

1. In the Office Action, the Examiner rejected claims 2-4 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,034,304 issued to Feely ("Feely") in view of U.S. Publication No. 2004/0038531 issued to Nagai et al. ("Nagai"). Applicants respectfully traverse the rejection and contend that the Examiner has not met the burden of establishing a *prima facie* case of obviousness.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *MPEP* §2143, p. 2100-129 (8th Ed., rev. 2, May 2004). Applicants respectfully

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contend that there is no suggestion or motivation to combine their teachings, and thus no *prima facie* case of obviousness has been established.

Feely discloses a photosensitive compounds and thermally stable and aqueous developable negative images as discussed above.

Nagai discloses a method of manufacturing semiconductor apparatus. A novolac resin 11 is coated onto a silicon oxide film 10. A spin-on-glass (SOG) film 12 is coated onto the novolac resin 11 and thermally treated thereon. The SOG film 12 has an acid generating agent added therein (Nagai, paragraph [0035]). In another embodiment, an insulation film 201 is formed to cover an element formed on a silicon substrate (Nagai, paragraph [0089]). A first insulation layer 203 and a second insulation layer 204 both are formed on a wiring layer 202 (Nagai, paragraph [0090]). When the layers 203 and 204 are an organic-based film such as an organic SOG film, a fluorine added carbon film, a SiCo film, etc., then a patterning method may be employed by forming an inorganic-based film on these layers (Nagai, paragraph [0092])

Feely and Nagai, taken alone or in combination, do not disclose, suggest, or render obvious, at least one of (1) forming the resist using a highly absorbing material selected from fluorine (F), tin (Sn), bismuth (Bi), cesium (Cs), and antimony (Sb); (2) adding at least one of the fluorine (F), tin (Sn), bismuth (Bi), cesium (Cs), and antimony (Sb) into a baseline material; and (3) forming the resist using one of a fluoropolymer, a metallocene polymer, an alkoxide chelate polymer, and a carboxylate chelate polymer.

Feely does not disclose any one of the above, as agreed by the Examiner. In the Office Action, the Examiner states that Nagai discloses that the highly absorbing material in the photoactive acid generating resist is a fluorine added polymeric film (Office Action, page 3, paragraph number 4). Applicants respectfully disagree. Nagai merely discloses the first and second insulation layers 203 and 204 being an organic SOG film, or a fluorine added carbon film (Nagai, Paragraph [0092]). Since these insulation layers exist in the semiconductor device 200, they cannot be a resist which is etched away after patterning.

2. In the Office Action, the Examiner rejected claims 9-24 under 35 U.S.C. §103(a) as being unpatentable over Feely in view of Nagai. Applicants respectfully traverse the rejection and

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contend that the Examiner has not met the burden of establishing a prima facie case of obviousness.

Feely discloses a photosensitive compounds and thermally stable and aqueous developable negative images as discussed above. Nagai discloses a method of manufacturing semiconductor apparatus as discussed above.

Feely and Nagai, taken alone or in combination, do not disclose, suggest, or render obvious, at least one of (1) forming an imaging layer from a resist made of a highly absorbing material, the layer being thinned to a pre-determined thickness, the layer having improved efficiency of a photoactive acid generator (PAG) to capture secondary electrons produced by an ionizing radiation; and (2) forming an etch resistant layer below the imaging layer for pattern transfer from the imaging layer.

As discussed above, among other things, neither Feely and Nagai discloses the layer having improved efficiency of a PAG to capture secondary electrons. In addition, neither discloses an etch resistant layer. In the Office Action, the Examiner states that Nagai discloses forming a novolac resin polymeric film on the semiconductor device, and forming a photoactive SOG film on the resin polymeric film, and patterning the novolac resin film using the patterned SOG film as the mask (Office Action, page 4, last paragraph). However, none of these, even if they are correct, is related to an etch resistant layer below the imaging layer for pattern transfer.

Nagai merely discloses a substrate processing agent 109 being added with an acid generating agent is coated by a spin-on method, and then an ArF resist 110 being coated thereon (Nagai, paragraph [0075]; Figures 8C-8D). None of these corresponds to an etch resistant layer below the imaging layer.

The Examiner failed to establish a prima facie case of obviousness and failed to show there is teaching, suggestion or motivation to combine the references. When applying 35 U.S.C. 103, the following tenets of patent law must be adhered to: (A) The claimed invention must be considered as a whole; (B) The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination; (C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; and (D) Reasonable expectation of success is the standard with which obviousness is determined. Hodosh v. Block Drug Co., Inc., 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir.

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1986). "When determining the patentability of a claimed invention which combined two known elements, 'the question is whether there is something in the prior art as a whole suggest the desirability, and thus the obviousness, of making the combination.'" In re Beattie, Lindemann Maschinfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 1462, 221 USPQ (BNA) 481, 488 (Fed. Cir. 1984). To defeat patentability based on obviousness, the suggestion to make the new product having the claimed characteristics must come from the prior art, not from the hindsight knowledge of the invention. Interconnect Planning Corp. v. Feil, 744 F.2d 1132, 1143, 227 USPQ (BNA) 543, 551 (Fed. Cir. 1985). To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the Examiner to show a motivation to combine the references that create the case of obviousness. In other words, the Examiner must show reasons that a skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the prior elements from the cited prior references for combination in the manner claimed. In re Rouffet, 149 F.3d 1350 (Fed. Cir. 1996), 47 USPQ 2d (BNA) 1453. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or implicitly suggest the claimed invention or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." Ex parte Clapp, 227 USPQ 972, 973. (Bd.Pat.App.&Inter. 1985). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Furthermore, although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." In re Mills 916 F.2d at 682, 16 USPQ2d at 1432; In re Fitch, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992).

In the present invention, the cited references do not expressly or implicitly suggest any of the above elements. In addition, the Examiner failed to present a convincing line of reasoning as to why a combination of Feely and Nagai is an obvious application of absorptive resists in an EUV imaging layer.

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Therefore, Applicants believe that independent claims 1, 9 and 17 and their respective dependent claims are distinguishable over the cited prior art references. Accordingly, Applicants respectfully request the rejections under 35 U.S.C. §103(a) be withdrawn.

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Conclusion

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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